



# Alimentary exploration in the seeds of *Phoenix dactylifera*

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## General Note

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## ABSTRACT

Seed of the *Phoenix dactylifera* was deliberated as waste material from the date fruit processing industry. Each date seed evaluates about 11–18% of the total date fruit weight. Proximate study displayed that date seed is composed of carbohydrate, dietary fiber, fat, ash, protein, antioxidant and phenolic contents. In fact these seeds are excellent source of dietary fibers. The present study was an attempt to effectively use the total dietary fibers present in the date seeds and characterize the particles using laboratory techniques. Alongside the nutritional contents of the date seeds were also determined. Further studies on the seeds of *Phoenix dactylifera* is being carried for the formulation of commercial products.

**Keywords:** *Phoenix dactylifera*, Dietary fibers, Antioxidant, Nutritional analysis

## 1. INTRODUCTION

The date palm (*Phoenix dactylifera*) is considered as one of the oldest cultivated fruit trees. It is the most important staple food in many nations notably in Arab countries (UAE). India imports around 250,000 million tons of dates per year and considered to be the largest importer of the fruit. As a result enormous amount of date seed has been produced as a by-product. According to the report given by the Food and Agriculture Organization of the United Nations 7 million tons of dates were cultivated globally in the year 2010, out of which approximately more than one million tons of date seeds were produced. Usually date seeds are mentioned by various names such as date pits, date kernels, date stones and date pips. Outward appearance of date seed is hard coated which is oblong, ventrally grooved with a small embryo. Depending on the variety and maturity of the fruit, date pits weigh around 0.5 to 4 g which represents 6 to 20 % of the total weight. Nutritional attributes of the date seeds are 22.5-80.2 % of dietary fiber, 80.0-83.1 % of carbohydrates, 3.1-7.1 % of moisture, 2.3-6.4 % of protein, 5.0-13.2 % of fat and 0.9-1.8 % of ash. In addition to this date seed contains level of phenolics (3102-4430 mg gallic acid equivalents/100 g), antioxidants (580-929  $\mu$ mol trolox equivalents/g). Date seed is also enriched with appreciable amounts of macro nutrients such as Na, Ca, K, P, Mg and micro nutrients such as Fe, Cu, Mn and Zn. It also has 3.82% of non-reducing sugars, glucose and fructose of about 1.68 % and 1.53 % respectively.

Traditionally, date seeds are used as feed for cattle, sheep, camel and poultry in grinded form with smaller size. Pelleted seeds are used for burning purposes. They can be a potential source of oil which has antioxidant properties. It had set up its mark in pharmaceutical industries and also in cosmetics production. It has been used as a raw material for activated carbon or as an adsorbent for dye containing water. Date pit extract produced a good result in restoring the normal functioning of the poisoned liver and also it gave protection against carbon tetrachloride and hepatotoxicity on the liver in rats. Dietary fibers are commonly known for their beneficial effects on cancer and prevention of type 2 diabetes. Overproduction of free radicals and reactive oxygen species (ROS) contributes oxidative stress in human which leads to cell damage and cellular mechanism disruptions. Antioxidants are the next major property present in date seeds which inactivates lipid free radical chain reactions and prevents the hydro peroxide conversion into reactive oxradicals.

As far as flavonoids are concerned it includes catechin and epicatechin which are most abundant in Khalas variety and possess highest beneficial health effects among the polyphenols. Because of the high polyphenol contents and nutritional values date pits are being projected as a significant functional agent in food industry. The term dietary fiber includes polysaccharides, oligosaccharides and lignin. National Academy of Science defined the dietary fiber as non-digestible carbohydrates and lignin which have beneficial physiological effects in humans and total fiber as sum of the dietary fiber and functional fiber. It is categorized into soluble fiber and insoluble fiber. Cellulose, hemicelluloses and lignin are not soluble in water and on the other hand pectin, mucilage become gummy in water. Food fibers marked a significant place in food industry which led to the production of fiber-rich food products and ingredients in the recent years. In commercial scale dietary fiber has been supplemented in the form of cookies and crackers.



**Figure 1** Date seeds after drying and grinded seed powder

## 2. MATERIAL AND METHODS

### Date seed

Date fruits (250 g) were purchased from local market; the flesh was removed and pits were collected. To remove excess flesh which were adhered to the pits was removed by using tap water, the cleaned date pits were left to dry at room temperature for 24 hours to

remove the surface water on the seed. Collected samples were dried under hot air oven at 60°C for 24 hours and grinded into fine powder by the use of metallic mortar and pestle finally sieved (Figure 1).

### Sample extraction

Grinded date seed powder was subjected into sonication to get the particle size even. The date seed powder (1g) was mixed with 25ml of water and sonicated for 5 min and dried under rotary evaporator. The extraction of date seed (1g) was carried out by using 40ml of methanol/water (1:1, v/v).

### Nutritional analysis

**Total Protein content:** Total protein content of pit-extract was determined by lowry's method and Bovine serum albumin (BSA) was used as standard. Total protein content expressed as mg/ml of sample. The values were expressed as mean of three replicates  $\pm$  standard deviation.

**Total Antioxidant content:** TAC of seed extract was determined calorimetrically by using Phosphomolybdenum method. The prepared sample extract of 0.4 ml was mixed with 4ml of reagent which contains 0.6M sulphuric acid, 28mM sodium phosphate and 4mM ammonium molybdate. This mixture was incubated in water bath at 95°C for 90 min. when the temperature of this mixture came down to room temperature, the absorbance of the reaction mixture was measured at 695 nm against blank and standard solution. Total Antioxidant Content was expressed as mg per ml sample. The values were expressed as mean of three replicates  $\pm$  standard deviation.

**Total Phenolic content:** TPC was determined according to Folin-ciocalteu method with slight modification. The seed extract of 0.5ml was mixed with 2.5ml of 10% Folin-ciocalteu reagent and allowed to stand for 5 min at room temperature. Then 2.5ml of 7% sodium carbonate was added to this mixture and allowed to react for 90 min at room temperature. Absorbance was measured at 765nm using UV-Spectrophotometer. Total phenolic content was expressed as mg of gallic acid equivalents per 20g of date seed.

**Dietary fiber content:** Dietary fiber content was determined using enzymatic gravimetric method (AOAC: 985.29). Homogenized dried sample was treated with petroleum ether to remove fat (>10%) content present in the sample. Defatted duplicate test portions were gelatinized by  $\alpha$ -amylase enzyme; protein and starch content in sample were removed by protease and amyloglucosidase respectively. Precipitation was done by adding 4 volume of ethanol followed by filtration process. Filtered sample was washed with ethanol and acetone. Collected sample was subjected to drying to obtain the Total Dietary Fiber. It was expressed as g per 20g of date seed.

## 3. RESULTS AND DISCUSSION

### Protein Estimation:

To estimate the protein, Lowry's method was followed where the protein concentration lies in the reactivity of the peptide nitrogen with the copper [II] ions under alkaline conditions and the subsequent reduction of the Folin-Ciocalteu phosphomolybdic phosphotungstic acid to heteromolybdenum blue by the copper-catalyzed oxidation of aromatic acids. The amount of protein present in the date seed extract was found to be 47.4 mg/g of date seed powder.

### Total antioxidant capacity:

Total antioxidant capacity assay is a spectroscopic method for the quantitative determination of antioxidant capacity, through the formation of phosphor molybdenum complex. Reduction of Molybdenum (VI) to Molybdenum (V) by the sample analyte and subsequent formation of green phosphate Molybdenum (V) complex at acidic pH range. Total antioxidant capacity was calculated by the method described. The amount of total antioxidant capacity present in the date seed extract was found to be 7.676 mg/g of date seed powder.

### Total Phenolic content:

Reduction of phosphomolybdic-phosphotungstic acid (folin) reagent to a blue colored complex in an alkaline solution occurs in the presence of phenolic compounds. The content of total phenolic in date seed extract was determined using Folin-Ciocalteu assay, expressed as Gallic acid equivalents (GAE). The amount of total phenolic present at the date seed extract was found to be 57.83 mg/g of date seed powder.

#### Total Dietary fiber content:

Enzymatic-gravimetric method was used to determine the Total Dietary Fiber (TDF), where the sum of soluble and insoluble polysaccharides and lignin were measured as a unit and considered to be Total Dietary Fiber (TDF). It was calculated from the below given formulae.

$$\begin{aligned} \text{TDF} &= [\text{weight (residue)} - \text{weight (ash)} - \text{weight (protein)}] / \text{weight test portion} \\ &= 0.6202 \text{ g / g of date seed powder} \end{aligned}$$

Total dietary fiber contents in date seed powder was determined as 62%. It shows the enriched dietary fiber content in the date seeds. Dietary fiber content in date seeds varies from 60-80%, it depends on the maturation stage and varieties of date seeds.

#### 4. CONCLUSION

Various studies have been conducted on dates seed found the nutritional composition of the seeds of *Phoenix dactylifera* which includes of carbohydrate, dietary fiber, fat, ash, protein, antioxidant and phenolic contents. The trace amount of soluble dietary fiber helps people to relieve from constipation problems by increasing the volume of fecal bulk. It decreases the time of intestinal transit, cholesterol and glycaemic levels, trapping substances that can be dangerous for the human. Depending on their composition they can be formulated for commercial establishments.

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